PBT Reduction Strategy: Progress Report to City Council
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February 6, 2003

Introduction
On July 1, 2002 the Seattle City Council, with the Mayor concurring, adopted Resolution 30487. This resolution directs consideration of persistent bioaccumulative toxic chemicals in making City purchasing decisions by developing purchasing criteria and an implementation plan. This report describes progress to date.

Background
Persistent bioaccumulative toxic chemicals (PBTs) build up in the food chain and do not break down easily, posing risks to human health and the environment. PBTs are associated with a range of effects, including effects on the nervous system and reproductive system, and associated developmental problems, cancer, and genetic impacts. PBTs can travel long distances and transfer easily between air, water, and land. Children and developing fetuses are more at risk of adverse health effects from PBTs.

Both the federal and Washington state governments are implementing PBT reduction strategies. The Environmental Protection Agency has established 12 priority PBTs as the initial focus of their strategy and the Washington Department of Ecology has created a draft working priority list of 22 PBTs. The first PBT Ecology is focusing on is mercury due to its widespread use and potential releases.

Seattle PBT Reduction Initiative
Based on a review of products and other potential PBT sources in its operations, the City has adopted the following list of priority PBTs after considering the amount of products used and amount of PBTs in products. This list is a subset of the EPA and Ecology lists (Attachment 1) and is the starting point for the City's PBT reduction strategy: ***Mercury, Cadmium, Lead, PCBs, PAHs, PCNB (fungicide), and Dioxinx/Furans***.

PBT Reduction Goal
The goal of this strategy is to reduce the risks to human health and the environment from the production, use and disposal of products containing (or releasing during their manufacture) PBTs. The City will implement this strategy to reduce risks from PBTs, while balancing other considerations including human health and environmental concerns as well as economic and social goals. Many programs are already in place to reduce PBTs in City operations, as the reduction of such chemicals has long been a goal of the City's environmental programs. Resolution 30487 establishes a 10% price preference for non-PBT alternatives based on product life cycle.

Approach
The City's approach is to focus our resources on those products that have greatest potential for PBT reduction based on the following criteria:
- Product quantities used
- Amount of PBTs that can be reduced
- Availability and cost effectiveness of alternatives

PBT Reduction Opportunities & Recommendations
Products used in City operations that contain or result in the production of PBTs were inventoried and are presented in Attachment 2. These alternatives were evaluated and recommendations are included in Attachment 3.

Next Steps
Implementation timing for each of the recommendations is noted in Attachment 3. Additionally, OSE will work with departments to determine how we can best measure progress toward our goal of reducing PBTs in City operations. The OSE Director will report on progress to the Energy and Environmental Policy Committee at least every 6 months during regular Director's Reports, or as otherwise requested

Attachment 1

City of Seattle, Office of Sustainability & Environment
PBT Priority Lists – EPA and WA Department of Ecology

EPA's First 12 Priority PBTs

Aldrin/dieldrin
Benzo(a)pyrene
Chlordane
DDT, DDP, DDE
Hexachlorobenzene
Alkyl-lead
Mercury
Mirex
Octachlorostyrene
PCBs
Dioxins/furans
Toxaphene

WA Department of Ecology Draft PBT Working List

Cadmium
Lead
Mercury
Dicofol
Endosulfan
Lindane
Methoxychlor
Pendimethalin
Pentachlorobenzene/pentachloronitrobenzene (PCNB)
Trifluralin
1,2,4,5-tetrachlorobenze
aldrin/dieldrin
Chlordane
DDT/DDD/DDE
Heptachlor epoxide
Toxaphene
Pentabromo diphenyl ether
Hexachlorobenzene
Hexachlorobutadiene
Dioxins, Furans
PAHs
PCBs

City of Seattle, Office of Sustainability & Environment
PBT Source Inventory

Attachment 2

Chemical	Sources	City Uses/ Sources	Alternatives	Amount of chemical released during production, use, or disposal	Environmental & Health Considerations	Economic Considerations Where Feasible Alternatives Exist
Metals						
Cadmium	Ni-Cad batteries Plating for steel Stabilizer for vinyl chloride	Batteries Industrial batteries ▪ Servers ▪ Emergency backup ▪ Substations Computer monitors	Batteries are recycled and where appropriate rechargeable batteries are used. See computer monitor discussion below.	Not quantified	Damages the lungs, can cause kidney disease, and may irritate the digestive tract.	See discussion below regarding computer monitors.
Lead	▪ Batteries ▪ Lead paint ▪ Computer monitors-CRT ▪ Other cathode ray tubes – televisions	Batteries Lead paint on water tanks, bridges, dams parts: Water dept. lead joint compounds Computer monitors	Batteries are recycled and rechargeable batteries used where feasible. ▪ Most water tank sites have been sampled and remediation complete or in process ▪ Lead abatement (encapsulation or removal) is undertaken on structures during renovation and maintenance ▪ No alt for lead joint compound – used very rarely – only 1 or 2x per year, only on 42”mains ▪ City is transitioning to flat screen monitors. Computer monitors are donated for reuse or recycled	Lead paint on structures is removed and disposed or encapsulated. Lead chips are contained and disposed during renovation and demolition work. A CRT monitor contains ~2.4 lbs of lead	Stored in bone, travels across the placenta Linked to wide range of health effects including cancer, brain damage, muscle weakness, sterility. Can cause irreversible neurological damage in children at very low levels. Toxic to aquatic species and wildlife.	Computer Monitors: 1,500 monitors purchased each year, cost difference between traditional (CRT) and flat screen (LCD) over five years of operation is $122.85 (11%) when energy costs are factored in. Up front purchase cost increment is $150 (14%)

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Mercury	▪ Thermostats ▪ Fluorescent lights ▪ Electrical switches ▪ Dental amalgams ▪ Batteries	▪ Time delay relays in Muni bldg (relays will be disposed as hazardous waste when the building is demolished) ▪ Batteries ▪ Fluorescent lamps- ▪ HPS – Street lamps, floods ▪ Electrical switches ▪ Fluoride tank indicator/gauge at Tolt Treatment Plant contains mercury- it is sealed and protected. Hazardous materials unit would handle response if spill or replacement.	▪ Batteries are recycled, battery recyclers are expanding battery types they accept ▪ City purchases low-mercury fluorescent tubes ▪ Fluorescent lamps removed from service are recycled (regular and low mercury) ▪ Mercury switches in fleet vehicles are removed when vehicles are retired ▪ HPS Lamps ▪ SCL is testing low-mercury street lamp alternatives	There is one gram of mercury in each trunk switch which can be released to the environment when the vehicle is crushed. It is estimated that 253 pounds of mercury are released each year in WA from auto switches.	Neurotoxin, brain, lung, kidney damage. Travels across the placenta and via breast milk so is particularly high risk for fetus and young child ~1,800 pounds are released in WA each year Fish consumption is one of the most common exposure pathways. 1 gram of mercury – amount in a thermometer or a trunk switch, can contaminate the fish in a 20 acre lake to the point where they are unsafe for human consumption (MN Pollution Control Agency)	Low mercury fluorescent tubes do not cost any more than regular quality energy conserving tubes. In fact, they cost about 13 cents less. Mercury containing trunk switches are removed when vehicles are surplused at a cost of $30/switch. Cost for removing all mercury-containing switches in fleet (will be complete by 2010) is ~$60,000.

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Pesticides						
Pentachloro nitrobenzene (PCNB)	Fungicide	Golf course fungal disease treatment	Maintaining playability standards requires aggressive disease management. Alternatives would require more frequent application and are not as effective against the most common diseases.	~410 lbs applied per year (average use 01/02) directly into the environment.	Possible carcinogen, persistent Metabolite is a probable carcinogen.	
Dioxins/ Furans Not a product but a by-product of certain manufacturing processes					Known carcinogen, birth defects, immune system suppression, learning & behavioral problems. Reproductive, behavioral and physical effects in wildlife.	
	PCB production	▪ May be contaminant of oil containing high levels of PCBs, created in the manufacturing process ▪ Can be generated from incomplete combustion of PCB containing oil	See PCBs			

	Paper production	▪ Generated during paper chlorine bleaching processes. City purchases approx. 200,000 reams of copy/printer paper per year	City purchases "elemental chlorine free" printer and copier paper which uses a chlorine dioxide bleaching process which generates less dioxin than previous processes (which are no longer legal) Process chlorine free paper uses no chlorine in its production but may incorporate recycled materials which were originally bleached.	ECF (elementally chlorine-free) paper results in the annual production of 0.0016 grams of dioxin production per 200,000 reams		Price difference for purchasing PCF (process chlorine free) paper which results in no additional dioxin production is 80% or $320,000/year ($3.60/ream v. $2/ream)
	PVC (polyvinyl chloride) contaminant used in some plastics Common in many office products and building materials and pipes.	Office supplies – common examples: ▪ Media storage sleeves and pages ▪ Paper clips ▪ Sheet protectors ▪ 3-Ring binders ▪ Report covers ▪ Organizers, portfolios, ▪ Dust covers for computers and equipment ▪ Presentation easels Building materials Water/electrical system piping and conduit	Alternatives including paperboard binders, paper report covers etc are generally available at comparable prices. Still Being Evaluated Still Being Evaluated	Not quantified		TBD

	Pentachloro-phenol (penta) contaminant	▪ 100,000 poles in service of which 60,000 – 70,000 are penta treated ▪ Pole lasts ~40-60 years ▪ Majority of penta treated poles are butt-treated cedar ▪ 1,500 – 2,000 new poles purchased each year – Approximately 80% are penta butt treated cedar ▪ Copper napthenate (CuN) is used on full-length treated poles	▪ SCL has committed to eliminating penta-treated poles however CuN butt-treated poles have not been previously available. SCL issued an RFP for butt-treated CuN poles in Dec 2002 and will be awarding a contract in January. Once that contract is in effect, no additional penta-treated poles will be purchased.. ▪ As of August 2002, all newly purchased poles are equipped with liners installed by the manufacturer. There are over 1,100 lined poles in place to date. ▪ SCL is continuing to pilot test various types of liners and will also be testing use of liners on untreated wood. ▪ The SCL system is designed for use of wood poles – mounting equipment, climbing equipment, tools, and work practices. Wood poles are the least conductive providing an extra margin of safety to crews. ▪ Alternatives like steel require more energy in production.	EPA's draft dioxin Reassessment (2000) states that, although field studies demonstrate that dioxins leach into soils from penta-treated wood, no studies provide a reliable estimate of the release rate. EPA does not consider penta-treated poles a significant source of dioxin in the environment. Manufacturer/treat-ment facility reported env. releases for 2000: ▪ Vulcan, (only penta manufacturer in the US):released 1lb of penta and 0.67 pounds dioxin ▪ The average release reported by WA wood treatment facilities was 54 pounds of penta and 0.01 pounds dioxin. ▪	Penta is a probable carcinogen, highly toxic to fish, and an endocrine disruptor. Pole liners act as a barrier between treated wood and environment. Treated wood is landfilled and not surplused to the public. SCL conducted a hazard assessment of wood preserva-tives and concluded that penta, due to dioxin contamination, poses greater potential hazards than CuN and that for both products, most of the chemicals remain bound to the wood.	CuN poles are comparable in price to penta-treated poles. The cost of lining a pole has decreased from $120/pole during pilot testing to $50 per pole (typical cost for a pole - materials +install ~ $1,500). Total costs to line all poles in 2003 ~$100,000 per year. SCL plans to charge a portion of liner cost to pole co-owners (Qwest, Metro, State) and in billed jobs. This would recoup ~$40,000. Liners extend pole life substantially.

PCBs	di-electric (insulating) fluid in transformers PCBs were banned from manufacture in 1977 but use in in-service equipment is still allowed. SCL began purchasing only PCB-free oil in the mid-80s. All new oil-filled electrical equipment is manufacturer certified to contain PCB-free oil.	Total transformers in-service ~ 55,000. PCB content of over half is known. Of the transformers of known PCB content: ▪ PCB-free transformers (<1ppm): ~ 41% ▪ Transformers containing 1-49 ppm PCBs: ~11% ▪ Transformers with PCBs ≥50 ppm: <1% ▪ Transformers known to contain ≥500 ppm PCBs: less than 20. This equipment is inspected at least annually. ▪ Transformers are tested when removed from service or during maintenance. ▪ If found to contain PCBs are either disposed of or retrofilled with PCB-free fluid. ▪	▪ All new oil-filled electrical equipment is manufacturer certified to contain PCB-free oil. ▪ 1-45 ppm PCB containing oil is sent to LaFarge for energy recovery in the cement kiln south of downtown. This is the majority of the PCB containing used oil. ▪ Most (~15) of the known PCB transformers (≥500 ppm) are scheduled for removal as part of planned major system upgrades. ▪ Fluorescent light ballasts are disposed as PCB-waste if they lack a label stating non-PCB.	Spills are cleaned up to less than 1ppm in soils	Probable human carcinogen, damages the stomach, causes skin irritation, liver and kidney damage. Impacts the immune system. Endocrine disruptor.	Cost for dechlorination or incineration ($1.75/gal) of the 1-45 ppm PCB containing oil versus sending it for energy recovery (.30/gal) would be (583% increment) ~$50,000 – $100,000 annually and would require transport to dechlorination/ incineration facility in Alabama. This greatly increases the risk of spills as well as contributing to other transportation-related environmental issues such as fuel use, toxic air emissions, and climate change.

PAHs	By-product of incomplete burning of coal, oil, gas, wood, garbage. Also found in creosote, crude oil, roofing tar.	Diesel emissions Creosote-treated wood	Ultra-low sulfur diesel and biodiesel are used and particulate traps are being phased in to reduce the PAHs and other pollutants from our diesel fleet. Creosote-treated wood is no longer purchased. When Parks facilities are upgraded, any pre-existing creosote treated wood is replaced. SCL discontinued purchase of creosote-treated utility poles in the early 1980's. Some creosote-treated poles remain in service, as they have ~50 year life.	Not quantified.	Likely carcinogen, linked to reproductive and immune system effects, cataracts, kidney and liver damage, and skin irritation.	ULSD costs and additional $0.05/gal. over traditional diesel price of $1.24/gallon. The City purchases ~760,000 gallons per year for a total cost increment of ~$38,000.
Hexachlorobenzene	Byproduct from making other chemicals including PVC, PCP and PCB	See Pentachlorophenol, PCB, and PVC sections above.				

City of Seattle, Office of Sustainability & Environment
PBT Reduction Initiative Summary

Attachment 3

Chemical/Use	Environmental/Health Issue Examples	Alternative	Cost	Reduction Potential	Recommendation
Mercury containing fluorescent tubes	Neurotoxin, brain, lung, kidney damage. Travels across the placenta and via breast milk so is particularly high risk for fetus and young child. 1 gram of mercury – amount in a thermometer or a trunk switch, can contaminate the fish in a 20 acre lake.	Continue using low-mercury fluorescent tubes and recycling them at end of life.	Cost neutral	About 32 fewer milligrams of mercury per tube	Continue
Mercury in car trunk switches		Remove prior to vehicle surplus. Purchase vehicles without mercury switches when available.	$30 per switch, assuming about 200 cars surplused each year - $6,000/year.	1 gram of mercury per switch (200 grams per year)	1st quarter: Re-evaluate due to concern that purchasers may replace missing switch with a mercury containing switch.
Lead (and other metals – mercury & cadmium) in CRT computer monitors	Stored in bone, travels across the placenta. Linked to wide range of health effects including cancer, brain damage, muscle weakness, sterility.	Flat panel (LCD) monitors, which last ~2 year longer, are City's preferred option	$150/monitor price difference (14%) $123/monitor (11% increment) after lower energy costs are considered. If all ~1,500 monitors purchased each year were flat panel - $184,500/year ($225,000 annual up front costs) for up to 5 years.	Up to 2.4 pounds of lead avoided per monitor – amount per year depends on how many purchased – potential of up to 3,600 pounds of lead avoided per year.	2nd quarter: Work with departments to identify opportunities and barriers for increasing the number of flat panel monitors purchased. Begin tracking and reporting on actual purchases.
Mercury, Lead, Cadmium in batteries	See health and environmental effects as listed above.	Batteries are recycled and rechargeable batteries are used where practical.	Varies	Varies	3rd quarter: Evaluate recycling program to assess potential for improvement.

PAHs in diesel emissions	Likely carcinogen, linked to reproductive and immune system effects, cataracts, kidney and liver damage, and skin irritation.	Ultra-low sulfur diesel (ULSD) and biodiesel are used and advanced pollution control devices (particulate traps) are being phased in to reduce the PAHs and other pollutants from our diesel fleet.	ULSD costs and additional $0.05/gal. over traditional diesel price of $1.24/gallon (4% increment). The City purchases ~760,000 gallons per year for a total cost increment of ~$38,000. Particulate traps cost between $5,000-8,000/vehicle.	Not quantified	Continue program. 1st & 2nd quarter: Evaluate potential for retrofitting off-road equipment with particulate traps.
PAHs in creosote-treated wood		Creosote-treated wood is no longer purchased. When Parks facilities are upgraded, any pre-existing creosote treated wood is replaced.	Costs vary depending on application	Not quantified	Continue to replace creosote treated wood during facility renovations.
PCNB – golf course fungicide	Possible carcinogen, persistent. Metabolite is a probable carcinogen.	Maintaining playability standards requires aggressive disease management. Alternatives would require more frequent application and are not as effective against the most common diseases and have environmental and human health risks as well.		~410 lbs applied per year (average use 01/02) directly into the environment.	Continue to evaluate and implement methods for reducing overall golf course fungicide use.

Penta-treated utility poles – (**dioxin**)	Known carcinogen, birth defects, immune system suppression, learning & behavioral problems. Reproductive, behavioral and physical effects in wildlife.	Switch to CuN butt-treated poles when contract is in place. Continue to install pole liners on all butt-treated penta poles. Continue liners when CuN becomes available as CuN also poses human health and environmental hazards and liners substantially extend pole life.	CuN poles are comparable in price to penta-treated poles. The cost of lining a pole is $50 per pole (typical cost for a pole - materials +install ~ $1,500 3% increment). Total costs to line all poles in 2003 ~$100,000 per year. SCL plans to charge a portion of liner cost to pole co-owners (Qwest, Metro, State) and in billed jobs. This would recoup ~$40,000.	Reduce dioxin and pentachlorophenol releases from chemical manufacturers, wood treatment companies, and in-service pole leaching to the environment.	Purchase only CuN butt-treated poles when contract is in place in early 2003. Continue lining all new poles.
Dioxin/PCB potentially released from burning of low level PCB containing oil		Currently, this used oil is sent to LaFarge in Seattle for use as fuel in cement kiln. Dechlorination/incineration as regulated waste – requires transport of liquid waste to facility in Alabama.	.30/gal LaFarge $1.75/gal incineration 583% increment ~$50,000 – $100,000	Amount of dioxin released from cement kiln is not available.	1st quarter: Further evaluate LaFarge energy recovery option. Investigate amount of dioxin actually released from both facility options.

Chlorine bleached Elementally Chlorine Free (ECF) paper (**dioxin**) 200,000 reams per year	Known carcinogen, birth defects, immune system suppression, learning & behavioral problems. Reproductive, behavioral and physical effects in wildlife.	Purchase PCF paper which uses no chlorine in the bleaching process	Using our current vendor (via the state contract) $3.60/ream versus $2/ream (80% increment) - $320,000 per year.	Amount of dioxin created in production of 200,000 reams – 0.0016 grams	2nd quarter: In light of Governor's Executive Order on Sustainability, encourage the state to add PCF paper to the state contract.
PVC office supplies (**dioxin**)		Purchase non-PVC alternatives where feasible	Generally cost neutral	Not quantified	1st quarter: The office supply commodity team will incorporate PVC into the sustainable purchasing scorecard used to evaluate environmental, social, and economic aspects of products and alternatives.

PBTs, including PVC in buildings and interiors	Known carcinogen, birth defects, immune system suppression, learning & behavioral problems. Reproductive, behavioral and physical effects in wildlife.	A range of alternatives is available for some PBT containing products.	Varies depending on product and application.	Not quantified	1st – 4th quarter: The Green Building Team supported by OSE will evaluate the uses, alternatives, operational considerations, and costs issues for PVC- and other PBT-containing products.* Based on this analysis a list of priority products for reduction efforts will be developed. The Green Building Team will work with commodity teams on reducing purchases of priority PVC products.

*The general process which will be followed is to inventory PBT-containing materials, establish priorities in the context of other City PBT sources, evaluate alternatives, create new standards and vendor contracts if necessary, and potentially create additional guidance in the Seattle Supplements to LEED and consider proposing an innovation credit for LEED projects for eliminating or reducing PBT materials purchases.